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Title: Progress towards design elements for a Great Lakes-wide aquatic invasive species early detection network

Great Lakes coastal systems are vulnerable to introduction of a wide variety of non-indigenous species (NIS), and the desire to effectively respond to future invaders is prompting efforts towards establishing a broad early-detection network. Such a network requires statistically-valid sampling designs to assess survey performance, detection probability, and effort required. We began our research into NIS detection strategies in 2005-2007, via a comprehensive multi-gear sampling effort of the St. Louis River estuary (SLRE). That work confirmed SLRE's status as an NIS hotspot (8 new benthic invertebrates detected), and elucidated elements of an early detection strategy such as overall effort required, prospects for optimizing sampling design, and applicable mathematical and statistical tools. Findings from this first phase of research informed the design for fish-NIS monitoring that the Fish and Wildlife Service has conducted in the SLRE since 2007 and now expanded to other coastal systems. In the summer of 2012, we initiated a second phase of NIS research with further sampling in the SLRE and a new sampling effort in Isle Royale coastal waters. Our goals include 1) explore the efficacy of larval fish as monitoring targets; 2) refine understanding of the role of gear combinations for efficient sampling of benthos; 3) evaluate transferability of SLRE findings to a system with very different physical setting, invasion pressure, and level of AIS concern; and 4) advance capability of DNA-based detection by expanding relevant signature libraries and comparing capabilities and challenges via paired traditional and DNA-based enumeration. Partners in this work include US-FWS-Ashland and MN-DNR (fish sampling), and US-NPS (Isle Royale work).